

U.S. PATENT APPLICATION
OF
PETRI BOMAN and KEVIN HINGE

RELATING TO A
HOUSING FOR AN ELECTRONIC DEVICE

EXPRESS MAIL NO. EL762542867US

Housing for an Electronic Device

Field of the Invention

The present invention relates to a housing for an electronic device and, particularly
5 but not exclusively, to a housing for a mobile telecommunications device such as a
mobile telephone.

Background of the Invention

A housing for a mobile telephone generally comprises a front and a rear casing. The
10 electronic circuitry and other components of the telephone are mounted on one
casing and the other casing part fits over it in a back-to-back relationship to form
an enclosure around the circuitry and components. The two casing halves are
attached to each other and are separable to enable access to the interior of the
15 telephone for maintenance and other requirements such as insertion or removal of a
SIM card. Additionally, design conscious consumers often prefer to personalise
their telephone by replacing one or both parts of the casing with another of a
different colour so it is important that a consumer can separate the casing portions
without difficulty. Screws or clips may be used to attach the two casing halves
together.

20 A disadvantage with a conventional housing such as that described above is that the
join between the two housing portions extends all the way around the assembled
telephone housing and is clearly visible. This compromises the design and
appearance of the telephone thereby reducing the overall quality and feel of the
25 product to consumers. Furthermore, the housing of a mobile telephone is subject
to considerable wear and must not break too readily when inadvertently dropped.
As the conventional housing is formed in two back-to-back parts releasably joined
together, the overall strength and rigidity of the housing is reduced thereby
increasing the likelihood that one or both parts will break on impact. It is possible
30 to increase the strength and rigidity of a conventional housing by increasing the
thickness of the materials from which the casing is made. However, this results in
an increase in overall weight which also needs to be kept to a minimum.

Summary of the Invention

It is one object of the present invention to overcome or alleviate the aforementioned disadvantages associated with a conventional housing for an electronic device.

5

According to the present invention, there is provided a housing for an electronic device comprising a unitary tubular body having an open end for insertion of electronic components therein.

10 The housing preferably includes a member for closing the open end of the tubular body.

The member is advantageously configured to support electronic components thereon. The electronic components may include a printed circuit board.

15

In a preferred embodiment, a portion of the inner peripheral wall of the member includes a recess to receive a transducer module.

20

A guide is formed on the body to receive and support electronic components mounted on the member. In one embodiment, the guide means is a rail.

Preferably, the body includes a plurality of apertures in one face to receive the keys of a keymat mounted on an inner wall of the body, and an opening in the other face opposite the apertures to receive a battery pack.

25

The body preferably also includes means to releasably secure a keymat retaining plate over the keymat.

30

In a preferred arrangement, a portion of the body overlaps the member, said body and member including co-operating means to mount the member on the body.

The co-operating means conveniently includes a flange on the member that forms an interference fit with the body.

Preferably, a lock is provided for releasably securing the member mounted to the body. The lock can include an aperture in the member and a boss in the body, fastening means being insertable through the aperture for engagement in the boss.

5

The present invention also relates to an electronic device incorporating the housing of the invention. Most preferably, the electronic device is a mobile telecommunications device.

10 The electronic device preferably includes a keymat, a keymat retaining plate and a battery pack, the retaining plate being configured such that the keymat is biased against the housing by the retaining plate when the battery pack is mounted in the housing.

15 In a preferred embodiment, the retaining plate includes resiliently deformable regions raised out of the plane of the plate, said regions being deflected back towards the plane of the plate by the battery pack when mounted in the housing, thereby biasing the keymat against the housing.

20 The resiliently deformable regions are preferably a plurality of spaced parallel ribs.

The present invention also relates to a method of forming a housing according to the invention for an electronic device according to the invention by permanently attaching at least two housing portions together.

25

The housing portions may be attached to each other by welding.

Alternatively, the housing portions may be attached by adhesive bonding.

30 The present invention also relates to a method of forming a housing for an electronic device both according to the invention, including the step of forming the housing in one piece.

In one embodiment, the housing is formed by extrusion.

In another embodiment, the housing is formed from sheet metal.

Brief Description of the Drawings

- 5 FIGURE 1 illustrates a perspective view of the housing of a mobile telephone of the invention together with a module shown removed from the open end of the housing, the module carrying the electronic componentry of the telephone;
- 10 FIGURE 2 illustrates a perspective view of the underside of the housing shown in Figure 1 together with the keymat, keymat retaining plate before insertion into the housing;
- 15 FIGURE 4 illustrates a perspective view of the underside of the module shown in Figure 1;
- 20 FIGURE 4 illustrates a perspective view of the transducer module for fitting to the module illustrated in Figure 3; and
- 25 FIGURE 5 illustrates a partial cross-section through the housing with the keymat, retaining plate and battery fitted thereto.

Detailed Description of the Preferred Embodiments

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings.

Referring now to the drawings, there is shown in Figure 1 and 2 a housing for a mobile telephone comprising a rigid unitary tubular body 1 open at one end 2. The front face 3 extends forward of the rear face 4 to form an overhang 5. The front face includes an aperture 6 for attachment of a transparent window 7 by laser welding (part of the window is shown fitted in the aperture 6, in Figure 2). Beneath the aperture 6 on the front face 3 is an array of smaller openings 8 through which the keys 9 of a keymat 10 may protrude. The rear face 4 has a rectangular aperture 11 therein opposite the array of smaller openings 8 in the front face 3 for insertion of a keymat 10, a keymat retaining plate 12 and a battery pack 13 in the order and direction shown by arrow A in Figure 2. These components will be explained in more detail hereinafter.

The body 1 includes integrally moulded guide rails 14 formed along each inside edge between the front and rear faces 3,4 to support a printed circuit board 15 and other electronic components 16 such as a liquid crystal display within the body 1. These components are mounted to a module 17 that fits over the open end 2 of the body 1 and interfaces with the edge of the open end 2 to close the body 1. The module 17 has an integrally moulded "U"-shaped clip 18 to receive and support the edge of the printed circuit board 15 and a spigot 16 to support its underside. Other electronic components are mounted to the PCB 15.

10 The module 17 includes an integrally formed boss 18 therein through which the antenna of the mobile telephone may extend. A portion 19 of the inner peripheral wall 20 of the module 17 is recessed to receive a transducer module 21 illustrated in Figure 4, and has a first elongate port 22 to allow for the transmission of infra-red waves through the module 17 from an emitter (not shown) mounted to the rear face 23 of the transducer module 21 that has a corresponding opening 24. Two further circular openings 25,26 are provided in the recess to receive an on/off key (not shown) and to allow for transmission of sound through the module 17 from a transducer (not shown). The transducer and on/off key are both mounted to the rear face 23 of the transducer module 21 which is provided with openings 25a,26a that correspond to the openings in the module 17.

The transducer module 21 is "L" shaped to fit the recess 19 in the peripheral wall 20 of the module 17 and has a reinforcing web 21a to increase its rigidity. A flexible electrical connector 27 extends from the transducer module 21 which connects to an interface on the printed circuit board 15.

The edge 28 of the printed circuit board 15 mounted to the module 17 locates on the top surface of the guide rails 14 and is slideably received within the body 1. When fully inserted into the body 1, the overhang 5 covers the electronic components and PCB 15 on the module 17 and closes the open end 2 of the body 1. The liquid crystal display is visible through the window 7 in the aperture 6 when the module 17 is located on the body 1. The module 17 includes a pair of apertures 29 therein and the body 1 has a pair of corresponding bosses 30 that are in alignment

when the module 17 is fitted to the body 1. Conventional screws 31 (not shown) extend through the apertures 29 and are threadingly engaged in the bosses 30 to releasably secure the module 17 to the body 1.

5 Referring now to Figure 2 and Figure 5, the keymat 10 is disposed within the body 1 such that the keys 9 protrude through the apertures 8 in the front face 3. The keymat 10 is maintained in position using a layer of adhesive 32 interspersed between the body 1 and the keymat 10. The keymat 10 is positioned within the body 1 by inserting it through the rectangular aperture 11 in the rear face 4. To further
10 retain the keymat 10 in position, the retaining plate 12 is positioned above the keymat 10 and locates under tabs 34 integrally formed on the body 1 between the front and rear faces 3,4. The retaining plate 12 is made from a resilient plastics material such as polyurethane and is a snap-fit under tabs 34.

15 The retaining plate 12 comprises an end portion 35 bent at right angles to the plane of the plate 12. A support block 36 is mounted to end portion 35 and co-operates with the closed end of the casing to further hold the retaining plate 12 in position in the body 1. Three ribs 40 are deformed out of the plane of the plate 12 directly above the keys 9. As is clearly shown in Figure 5, when the battery pack 13 is
20 inserted into the aperture 11, the ribs 40 are compressed (see rib 40a in Figure 5) by the underside 41 of the battery pack 13 to urge the plate 12 against the keymat 10, and the keymat 10 against the body 1. When the battery pack 13 is removed, the resilient nature of the material from which the plate 12 is made causes the ribs 40 to spring back into their original shape, as shown by rib 40 in Figure 5.

25 The retaining plate 12 includes an arm 45 that extends laterally from the other end of the plate 12. The printed circuit board 15 contacts the arm 45 when inserted into the body 1 to provide additional support for the printed circuit board 15 and the retaining plate 12.

30 The battery pack 13 is inserted into the body 1 through the aperture 11 from above (in the direction shown by arrow A in Figure 2) and the outer cover 46 of the back of the battery pack 13 locates within the edges of the aperture 11. A moulded lip 47

on the cover 46 engages beneath the rear face 4 of the body 1 to retain the battery pack 13 in position.

The body 1 of the housing may be formed using a number of different methods.

- 5 For example, it may be made in two parts which are subsequently permanently attached together by laser or ultrasonic welding, MIG or TIG welding or by using adhesive along their interface. Alternatively, the body 1 can be formed in one piece by extrusion, by injection moulding or by sheet metal forming. The body 1 can be made from either plastics material or metal.

10

Many modifications and variations of the invention falling within the terms of the following claims will be apparent to those skilled in the art and the foregoing description should be regarded as a description of the preferred embodiments only.